ENERGY FACILITY SITE EVALUATION COUNCIL
STATE OF WASHINGTON

IN THE MATTER OF APPLICATION NO. 96-1 OLYMPIC PIPE LINE COMPANY CROSS CASCADE PIPE LINE PROJECT	APPLICATION NO. 96-1 PREFILED TESTIMONY OF DAVID WILDERMAN EXHIBIT ____________ (DW-T) **ISSUE**: PLANT COMMUNITIES WITHIN GINGKO PETRIFIED FOREST STATE PARK **SPONSOR**: WASHINGTON STATE PARKS AND RECREATION COMMISSION

Q. Please provide your name and business address to the Council.

A. David Wilderman. Department of Natural Resources, Southeast Region, 713 E. Bowers Rd. Ellensburg, WA 98926.

Q. Please summarize your employment and educational background.

A. I have worked in my present position, Natural Resource Scientist, with the Department of Natural Resources (DNR) since April 1995. I am responsible for scientific support and various stewardship activities on the Department's Natural Area Preserves (NAPs) and Natural Resource Conservation Areas (NRCAs) in eastern Washington. This involves scientific monitoring of rare plant populations and plant communities, weed control and restoration projects, evaluating sites for establishment as NAPs or NRCAs, leading interpretive tours, and management planning. Eleven of the twenty-three NAPs and NRCAs are located in various steppe or shrub-steppe habitats.

Prior to this position, I was part of a team of specialists working with The Nature Conservancy on the 1994 Hanford Site Biodiversity Inventory. I conducted inventory, ecological assessment, and mapping of shrub-steppe plant communities on approximately 160,000 acres of the Hanford Site.

I also worked with the Bureau of Land Management, Spokane District as a Botanist in their student-cooperative program (1992-1993), and Salem District as a Biological Technician (1990-1991). This work involved rare plant and plant community inventory, plant population monitoring, and consulting with other specialists regarding project mitigations.

I received a Master of Forest Resources degree in Natural Ecosystem Management from the University of Washington (1993), and a B.S. in Biology from the University of Illinois (1990).

Q. Generally, what is the subject of your testimony?

A. My testimony concerns the plant communities within Gingko Petrified Forest State Park, potential impacts of the proposed Cross Cascade Pipeline construction on these communities, noxious weeds, and related mitigation and restoration issues.

Q. Are you familiar with the plant communities within Ginkgo Petrified Forest State Park?

A. Yes. My work for the past 7 years has focused on rare plants and plant communities in shrub-steppe areas, so I am well-acquainted with this environment and its various plant communities. I am also familiar with the particular plant communities within the Gingko Petrified Forest State Park from my work in other areas where they occur. I have encountered these types of communities on the Hanford Site inventory, during my work on eastern Washington BLM lands, and on several of the sites I currently help manage. I have collected monitoring data, assessed ecological conditions, and conducted weed control in these types of communities. Additionally, I have walked the preferred proposed pipeline route through the Gingko Petrified Forest State Park on three occasions.

Q. Please describe the plant communities within the park?

A. The park contains two different types of recognized shrub-steppe plant communities: big sagebrush/bluebunch wheatgrass and stiff sagebrush/Sandberg's bluegrass. The stiff sagebrush/Sandberg's bluegrass community dominates much of the site; big sagebrush/bluebunch wheatgrass is less abundant. Substantial areas of vegetation that is transitional between these two communities occurs where they grade together. The two communities form a mosaic on the landscape, with the stiff sagebrush/Sandberg's bluegrass present on lithosols (shallow, rocky soils) and the big sagebrush/bluebunch wheatgrass occupying areas of deeper, loamy soils. These are the typical soil conditions on which these communities occur. The deeper soil habitats are found primarily in draws and shallow depressions in the landscape; the lithosols are present on ridgetops and steeper slopes; transitional soils occupy slopes between these two positions.

The species composition of the communities varies over the landscape, reflecting the overall condition of different portions of the site. Along approximately 1.5 miles of the corridor length and its surroundings, the communities are good, intact examples of shrub-steppe vegetation. This includes the southern 1 mile of the preferred proposed route within the Park and approximately 0.5 miles just south of Interstate 90. In these areas, the communities contain a variety of native plant species representative of the respective community types. These areas have retained bunchgrass cover and have only small amounts of weedy non-native plants such as cheatgrass. The cryptogamic (moss and lichen) crust covers the majority of the available soil space.

Along other portions of the corridor, the communities have been substantially more altered. On shallow-soil habitats, these areas consist primarily of stiff sagebrush with scattered Sandberg's bluegrass and small amounts of cheatgrass. Cryptogamic crust cover in these habitats is very low. On deeper soils within these areas, the communities have lost much of their native bunchgrass cover and are instead dominated by big sagebrush and cheatgrass, a common non-native grass. The cryptogamic crust covers only a portion of the available soil space, particularly where cheatgrass is most abundant.

The major plant species in the stiff sagebrush/Sandberg's bluegrass community include: stiff sagebrush, several species of desert buckwheats, Sandberg's bluegrass, and various forbs. It also contains a moderate amount of bluebunch wheatgrass where it transitions to deeper soil habitat. The areas of best condition, as described above, contain very little cheatgrass and the cryptogamic crust covers 50-70% of the soil between rocks and plants.

Major species encountered in the big sagebrush/bluebunch wheatgrass community include: big sagebrush, bluebunch wheatgrass, Sandberg's bluegrass, Carey's balsamroot, and curvepod milkvetch. In the best condition areas, cheatgrass is found in only small amounts, primarily on south-facing sideslopes and in small, scattered soil disturbances. Again, the cryptogamic crust covers 50-70% of the soil space between plants in these areas.

Q. Generally, what is the health of the shrub-steppe environment in Washington State?

A. Approximately 60-70% of the shrub-steppe habitat historically present in eastern Washington has been converted to other uses, e.g. cropland, urban, residential, etc. Nearly all of what remains has been altered to some degree by livestock grazing, introduction of non-native plants, and changes in fire regimes. These phenomena have reduced the cover and diversity of native grasses and forbs, replaced or displaced native plants with non-native plants (e.g. cheatgrass), destroyed or damaged the cryptogamic crust, and/or removed shrub cover from many areas of shrub-steppe in Washington. Shrub-steppe communities that have remained essentially undisturbed are very rare.

Shrub-steppe is generally recognized as one of the highest priority habitats for protection in Washington State, due to its uniqueness, its declining availability, and its vulnerability to disturbance and alteration. Because of its warm, arid environment and shrub-grass structure that is unique within the state, the shrub-steppe supports a distinctive assemblage of plant and animal species, most of which are found only in this ecosystem. This ecosystem supports a disproportionately large number of Washington's endemic plant taxa (i.e. taxa found nowhere else) compared to other ecosystems in the state. It provides important breeding habitat for a number of bird species, several of which have been reduced to very small populations or are declining. The shrub-steppe supports a disproportionately large number of habitat-specialist bird species. For wildlife in general, it is considered a Priority Habitat by the WDFW based on its high wildlife density and diversity, the fact that it supports unique and dependent species, and because it is of limited availability and is highly vulnerable to habitat alteration.

Shrub-steppe habitats are highly vulnerable to alteration by disturbances, primarily because of the harsh climate they occur in and the presence of non-native plants that compete with native species. The low precipitation and warm temperatures of the region constitute a difficult climate for plant growth. Establishment and growth of native plants is slow and sporadic due to these conditions. Non-native plants, which generally favor soil disturbance, will often quickly dominate areas where the soil and native vegetation have been disturbed. This greatly inhibits the establishment and growth of native plants due to competition for water, nutrients, and light. In addition, many of the soils in the shrub-steppe ecosystem are easily eroded by wind and/or water if they do not have sufficient plant and/or cryptogamic crust cover. Cryptogamic crust, which aids in nutrient cycling, minimizing weed invasion, and reducing erosion, is very easily damaged by mechanical disturbances. In summary, these systems are easily disturbed, and once disturbed, are either invaded and dominated by non-native plants or require many years to recover to a state resembling the pre-disturbance system. There are many examples of shrub-steppe habitats that were disturbed 20-50 years ago and are still dominated by cheatgrass and other non-native species.

Q. Are you familiar with the proposal by the Applicant in this proceeding, Olympic Pipeline Company, to construct a petroleum pipeline through the park?

A. Yes. I have reviewed portions of Olympic Pipeline's revised application to EFSEC for site certification, portions of Olympic Pipeline's revised application for an easement submitted to the Washington State Parks and Recreation Commission, portions of the September 1998 Draft Environmental Impact Statement on the Cross Cascade Pipeline, and maps showing the proposed route through the Gingko Petrified Forest State Park. I also walked the proposed route through the Park with Olympic Pipeline and State Parks staff.

Q. In your opinion, how would construction of the proposed pipeline impact the plant communities within the park?

A. I expect that essentially all of the native vegetation within the corridor will be destroyed as a result of digging the trench, associated vehicle/equipment traffic, trampling, and moving of construction materials. Shrubs just outside the corridor edge may also be damaged or killed if they overhang the corridor. This will result in a 30'-60' wide band of disturbed soil with little or no native vegetation remaining, a total of 3.6-7.2 acres per mile of corridor, depending on its width.

In addition to the direct impacts within the corridor, there will be effects on the immediate surroundings and, in the long term, it presents a threat to the greater surroundings. Soil disturbance will be significant within the corridor, producing conditions that encourage the establishment and spread of non-native plants, e.g. cheatgrass, noxious weeds. Movement of non-native plants along disturbance corridors is a common phenomenon, and they often spread into the adjacent areas that have not been disturbed by the activity in the corridor. As a result, it is likely that pipeline construction will impact these communities to some degree outside of the actual corridor. As I described earlier, cheatgrass currently only occurs in small amounts over most of the area, and I saw very little evidence of other non-native plants. Establishing a corridor of disturbance within these communities greatly increases the potential for, and rate of, non-native plant invasion. If there is any post-construction vehicle use of the corridor for inspection, maintenance, or repairs, this almost certainly will further increase the spread of non-natives. Establishment of disturbance corridors, particularly if they receive any further use after construction, are a major source of the introduction and spread of non-native, weedy plants into areas where they previously did not occur or occurred in low numbers.

Q. Once these plant communities are disturbed, how readily can they be restored, and in what time-frame?

A. As I described briefly earlier, shrub-steppe communities generally require long periods of time to recover naturally, if they recover at all. This is due primarily to the difficult establishment and growing conditions and competition from non-native plants. These same factors make restoration of any shrub-steppe an extremely difficult and long-term process. In the case of the proposed pipeline corridor through the Gingko Petrified Forest State Park, restoration will be exceptionally difficult, if it is even possible, due to the large extent of relatively shallow, rocky soils and the very dry climate of the local area.

Restoration of shrub-steppe is still early in its development in terms of our knowledge and development of methods and techniques. There are few precedents of attempts to restore shrub-steppe in this region, and those that do exist took place on sites that differ significantly from the Park site. These other shrub-steppe restoration efforts have had moderate success at best, and most of these had relatively simple goals of trying to re-establish a few particular plant species. These have all taken place on deeper, loamy soil types which are much more conducive to re-establishing native vegetation. They also involved different plant communities, i.e. those that occur on deeper soils, than the communities that occupy most of the corridor route on the Park. No one, to my knowledge, has attempted to restore disturbed areas within the stiff sagebrush/Sandberg's bluegrass habitat type that dominates most of the corridor in the Park.

Restoration of the corridor communities will be exceptionally difficult due to the soil conditions along much of the route. The soils are very shallow to moderately shallow where the stiff sagebrush/Sandberg's bluegrass occurs, and are cobbly. This will make it difficult to remove and replace the topsoil, and presents very difficult conditions for plant establishment even if the topsoil was not being removed at all. Such soils have low water-holding capacity and limited rooting space, conditions that impede germination, establishment, and growth. Due to the cobble component, it will be very difficult to mechanically prepare the soils for any planting.

This area is also in a very low precipitation zone–ten inches or less annually. This is generally considered the most difficult precipitation zone in the shrub-steppe region for restoration or revegetation. Ten to twelve inches of annual precipitation is generally considered to be at the lower range for successful establishment of perennial grasses. Such dry conditions will greatly inhibit the re-establishment of native plants, particularly if they are seeded.

There is very limited knowledge about germination, propagation and establishment of most of the plant species present in the communities, particularly the stiff sagebrush/Sandberg’s bluegrass community. Work has been done with big sagebrush, and a substantial amount is known about bluebunch wheatgrass, Sandberg’s bluegrass, and some of the other bunchgrasses; however this has been in relation to restoring deeper-soil habitats such as big sagebrush/bluebunch wheatgrass communities. Very little is known about any of the shrub-steppe forb species, and very few attempts have been made to restore these species. Particularly in the shallow-soil habitats such as the stiff sagebrush/Sandberg’s bluegrass, restoring forb species will require considerable research and experimentation to determine if and how this can be accomplished. Again, restoration of this type of community simply has not been attempted to my knowledge, and thus there are no proven methods for successfully restoring these habitats.

We also have very limited knowledge about restoring the cryptogamic crust, which is an important component of long-term restoration in shrub-steppe communities. The crust helps to minimize soil erosion, aids in nutrient cycling (particularly nitrogen), may aid in water retention, and helps minimize invasion of non-native plants including cheatgrass. There has been some preliminary experimentation with “seeding” the algal component of the crust via pellets. This may be an option for accelerating the re-establishment of this component in the future; however this is still an experimental method that has only been preliminarily assessed. Removing the crust prior to disturbance and then replacing it may be useful on some sites; however it has not been tested and would be extremely difficult on this site due the rocky soils. Natural regeneration of the cryptogamic crust has not been well-documented, but estimates of recovery time range from a few years to over 100 years. The low end of this range is for the algal component of the crust, which is the first to re-establish. Re-establishment of lichens and mosses takes considerably longer. Under the soil and climate conditions of the Park site, I estimate the period for recovery would be toward the long end of the range, 50-100 years. If non-native plants, particularly cheatgrass, become a significant component of the site, cryptogamic crust recovery would take even longer or may not occur at all.

Competition from non-native plants would likely be an additional factor that would impede restoration of the corridor. This is a typical problem with revegetation and restoration efforts in the shrub-steppe. Once disturbed, cheatgrass and/or other non-native plants generally move into these habitats, preventing native plants from successfully establishing even when artificially seeded. Successful establishment of native plants then requires control of these non-native species, which is itself difficult to do without the use of substantial amounts of herbicide. Given the shallow soil depth over much of the corridor, cheatgrass invasion may not be as severe as on other soil types, e.g. sandy loams. However it would almost certainly occur to some degree and would likely be substantial enough to affect any restoration. While the soil conditions and dry climate present the greatest obstacles to restoration in this area, competition with these non-native species, primarily cheatgrass, add to the difficulty.

Shrub-steppe restoration, even under "good" conditions, is a long-term process. Climate conditions favorable enough for native plant establishment occur only sporadically. Historic climate data indicate that such conditions occur only 2-9 times per 100 years. Thus, re-establishment of vegetation often requires a number of years and repeated attempts at seeding or planting. This occurs with species we know the most about, i.e. bluebunch wheatgrass, Idaho fescue, big sagebrush, etc. For the species that have not been used in restorations or for which we have only limited knowledge, the length of time required for re-establishment is unknown. Once established at the desired density, there is additional time required for plants to grow to mature size. This typically requires more time for shrubs than other species in these systems. I know of no estimate for growth rates in stiff sagebrush, but given the conditions it grows in, the rate is probably slow. I would estimate it takes at least 20 years for stiff sagebrush to grow to mature size once established. Overall, I would estimate that if restoration of these communities was attempted, it would take a *minimum* of 25 years to re-establish the vascular vegetation to a point resembling the current community. This does not take into account any time required to determine how to re-establish many of the species. If this is taken into account, it would take considerably longer. This also does not allow for restoration of cryptogamic crust on the soil surface, a factor that is important for long-term restoration. Taking these aspects into account, I estimate it would take 50-100 years to fully restore all of the major components of the communities within the corridor to their pre-disturbance conditions, if it is possible at all.

Q. Is there anything that Olympic Pipeline can or should be required to do to eliminate or reduce the impacts on these plant communities, or to help restore them, in the event the

pipeline is authorized through Ginkgo Petrified Forest State Park?

A. The only way to completely eliminate impacts on the communities is to use an alternative route for the pipeline that does not go through these communities. A route that does go through the shrub-steppe area, but along its edge rather than through interior habitat, would greatly reduce the impacts. Obviously, the narrower the corridor, the less of an impact their would be on the communities. I would recommend that the corridor be strictly limited to the smallest width possible, 30' at the most.

Minimizing weedy non-native plant invasion, and attempting to restore these communities would require a variety of measures. A detailed restoration plan should be prepared prior to construction, stating what the objectives and criteria for success are, how soil will be maintained and prepared, what plant species will be used and how they will be re-established (i.e. seed or transplant), the sources of seed or transplants, how seeding and transplanting will be done, methods to enhance establishment, how weeds will be controlled, how the restoration will be monitored, and when and how follow-up treatments will be carried out.

I do have some specific recommendations that should be included in a restoration plan. However, this is not an all-inclusive list. Objectives and criteria for success should be based on data collected in the corridor prior to any construction, or from adjacent undisturbed communities. Objectives should be designed to result in a community structurally and compositionally the same as the pre-disturbance community. Top-soil should be removed separately during construction and replaced as completely as possible, with minimum mixing. Soil testing should be done in the disturbed area and in adjacent undisturbed soils to ascertain characteristics that may affect re-establishment of native vegetation. Any significant compaction (>1.6g/cc) should be remedied. I would not recommend adding nitrogen fertilizer, as this often increases the establishment and growth of weedy annual species. The addition of sucrose, or other significant carbon source, may be desirable if nitrogen levels are higher in the disturbed soils. Soil stabilization, using mulch, would probably be necessary due to the high winds that occur in this area. Mulch, and any other material brought into the restoration area, should be certified free of weed seeds. Organic matter may need to be added to the soil, however any mulch added for stabilization should be taken into account. Plant species used for restoration should include the native species present in the pre-disturbance community, including shrubs, grasses, and forbs. At a minimum, stiff sagebrush, at least one buckwheat species, Sandberg's bluegrass, bluebunch wheatgrass, and at least 3 forb species should be used. A few additional species, such as bottlebrush squirreltail, that are native to the area but not present in the existing community, should also be considered. These are species that may establish more readily and that are sometimes found in early-seral examples of the communities.

Re-establishment of plants should be done using a combination of transplants and seeding, as transplants generally are much more successful in the short-term and seeding provides a source for longer-term recruitment. Shrub tublings and bunchgrass plugs should be planted following seeding, using a rangeland drill, of forbs and grasses. Seeding should be done at appropriate rates, which would need to be determined experimentally for species that have not been used before. Transplants should be placed on 3'-5' centers for shrubs and 2'-3' centers for bunchgrasses. Seed for seeding and for propagating the transplants should be collected from the site, or from ecologically similar areas (i.e. areas of <10 inches annual precipitation with similar soils) within 60-100 miles of the Park. For a number of the species, particularly the forbs and shrubs, seed are not available commercially and would have to be collected for the project.

Irrigation should be used, as successful re-establishment on this site is unlikely without it. Irrigation may be done using drip or sprinkler systems. Use of a mobile spray truck would not be feasible as it would require driving through the area being restored, or establishing a road outside of the corridor.

Weed control should begin immediately before seeding and planting. Herbicides would likely be necessary to effectively control weedy plants in the corridor. An application of glyphosate is recommended prior to seeding and transplanting to eliminate any immediate weed problems. Follow-up weed control would probably be necessary after seeding and transplanting. Herbicides may also be necessary for follow-up treatment, however they would have to be carefully selected to avoid damage to seedlings and transplants. If annual grasses are a problem, mechanical control may be necessary either through hand-pulling or mowing. Vehicle use of the corridor after construction, i.e. during or after restoration efforts, would likely encourage the establishment of non-native plants and damage planting of native species. This should be avoided until the native vegetation has become well-established, although any such use of the corridor would diminish the effectiveness of the restoration.

Monitoring should be carried out annually for at least 5 years, semi-annually thereafter for a minimum of 20 years, and for any additional period until the restoration objectives are achieved. Monitoring should provide data that are statistically valid, can be directly related to the restoration objectives, and can be used to direct follow-up activities. In addition to weed control, follow-up procedures such as additional seeding, transplanting, or irrigation may be necessary. These or other follow-up procedures may need to be repeated multiple times to achieve the restoration objectives.

Q. In your opinion, would construction of the pipeline likely result in an increase in the spread of noxious weeds?

A. Yes. Disturbances such as this, e.g., roads and rights-of-way, are common vectors for the spread of weedy plants, including some of the noxious weed species. I have witnessed the introduction of noxious weed species into areas where they were previously not known as a result of road building and grading projects. This is because of the level of soil disturbance, which encourages the growth of many weed species, and the movement of seed into and along the corridor via vehicles and equipment. Currently, there are few if any noxious weeds present in the corridor route. There is diffuse knapweed present in surrounding disturbed areas, i.e., along roads & a small gravel pit, however. This species is likely to spread into the corridor during construction. Other Kittitas county noxious weed species with a potential to invade based on the habitat and geographic location include: puncturevine, kochia, dyer’s woad, Dalmatian toadflax, and mullein.

Once established in such a corridor, these species pose a threat to spread into the surroundings lands as well. In particular, diffuse knapweed, Dalmatian toadflax, and dyer’s woad are known to invade relatively undisturbed shrub-steppe habitats if there is a sufficient seed source established nearby. Roads and rights-of-way are common starting points for the spread of such species into surrounding lands.

Any use of the corridor by vehicles after construction for maintenance, repairs, etc., would further increase the risk of noxious weed spread. Such repeated use maintains a chronic level of soil disturbance that encourages weed establishment, and increases the chances of introducing weed seeds.

Q. Is there anything that Olympic Pipeline can or should be required to do to eliminate or reduce the risk of spread of noxious weeds, in the event the pipeline is authorized through Ginkgo Petrified Forest State Park?

A. While the risk cannot be completely eliminated due to the nature of the disturbance, there are things that can be done to reduce both the potential for spread and the risk of introduction of the species. Locating the pipeline along an existing road, on the edge of intact shrub-steppe habitat rather than in the interior, would reduce the risk of spread into such habitat and into the surrounding lands in general. As there is already an existing disturbance corridor, i.e. the road, construction along a route such as this would not be creating a new one. The risk of introducing noxious weed seed would not be reduced by this; however the risk of spread into adjacent areas would be substantially less.

There is nothing that can be done to completely eliminate the risk of introducing weed seed to the site; however there are measures that should be taken to reduce this risk. These include: using high-pressure water spray to clean vehicles and equipment when entering the site to remove mud, attached vegetation, and seeds, accompanied by visual inspections for such items; using only certified weed-free materials for any erosion control and restoration efforts; and ensuring that areas through which vehicles and equipment are moving within the work site are free of noxious weeds.

To reduce the chance of noxious weeds spreading, the corridor should be monitored for weed species beginning soon (within 2 weeks) after construction. If noxious weed species are detected, appropriate control measures should be used to prevent them from becoming established within the corridor. Appropriate control measures would depend on the species. Mechanical removal by hand should be used for very small infestations. The county Noxious Weed Board and State Parks officials should be consulted for control methods, as well as any additional means of reducing the risk of introduction.

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